VERBENONE-PLUS:

A NEW TOOL FOR PROTECTING TREES FROM BARK BEETLE ATTACK

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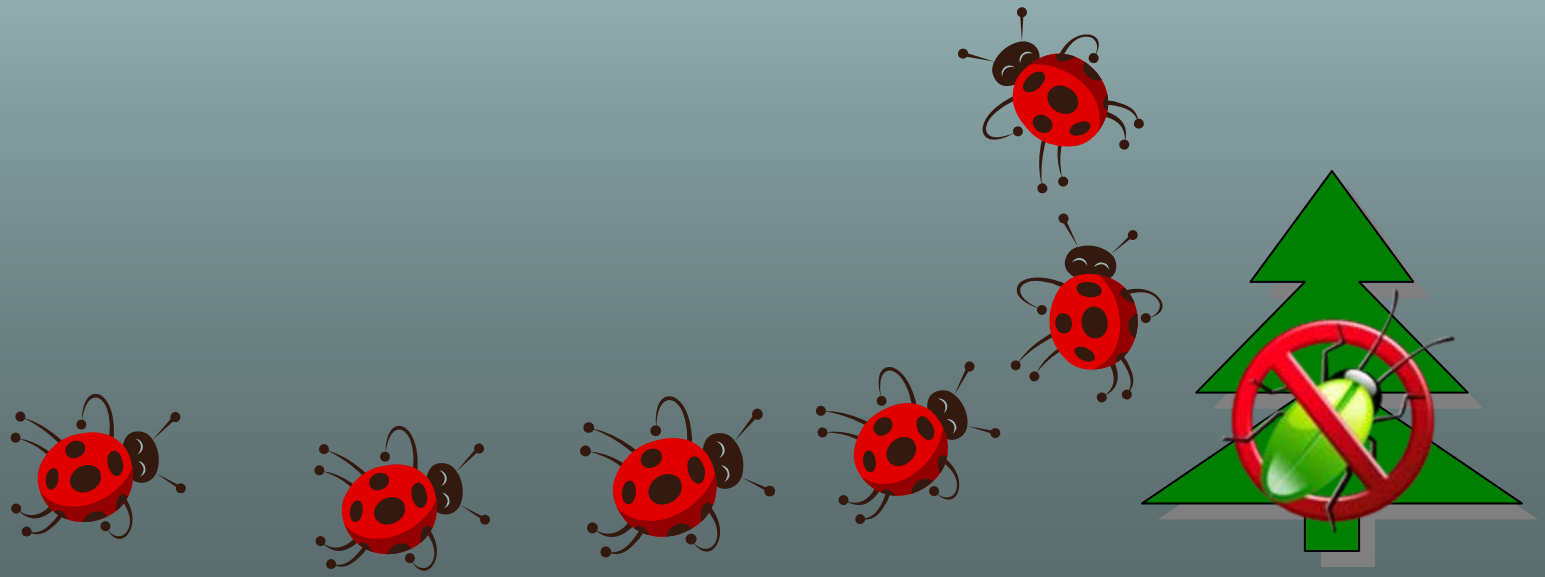

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VERBENONE

Naturally produced during a mass attack of bark beetles by:

- Auto oxidation of host monoterpene α-pinene
- By bark beetles
- Degradation of host material by associated fungi

Inhibits attraction of some bark beetle species to their aggregation pheromones.

Inhibition varies per bark beetle species.

Mountain pine beetle (*Dendroctonus ponderosae*) appears to be more sensitive to verbenone than western pine beetle (D. brevicomis).

Some success using verbenone to protect small stands from MPB.

No published reports of success in protecting small stands of ponderosa pine from WPB using verbenone.

PROTECTION OF SMALL STANDS OF PONDEROSA PINE FROM WPB USING VERBENONE

Established 12 (2 ha) plots in 2002

6 McCloud RD, Lassen National Forest

6 Placerville RD, Eldorado National Forest

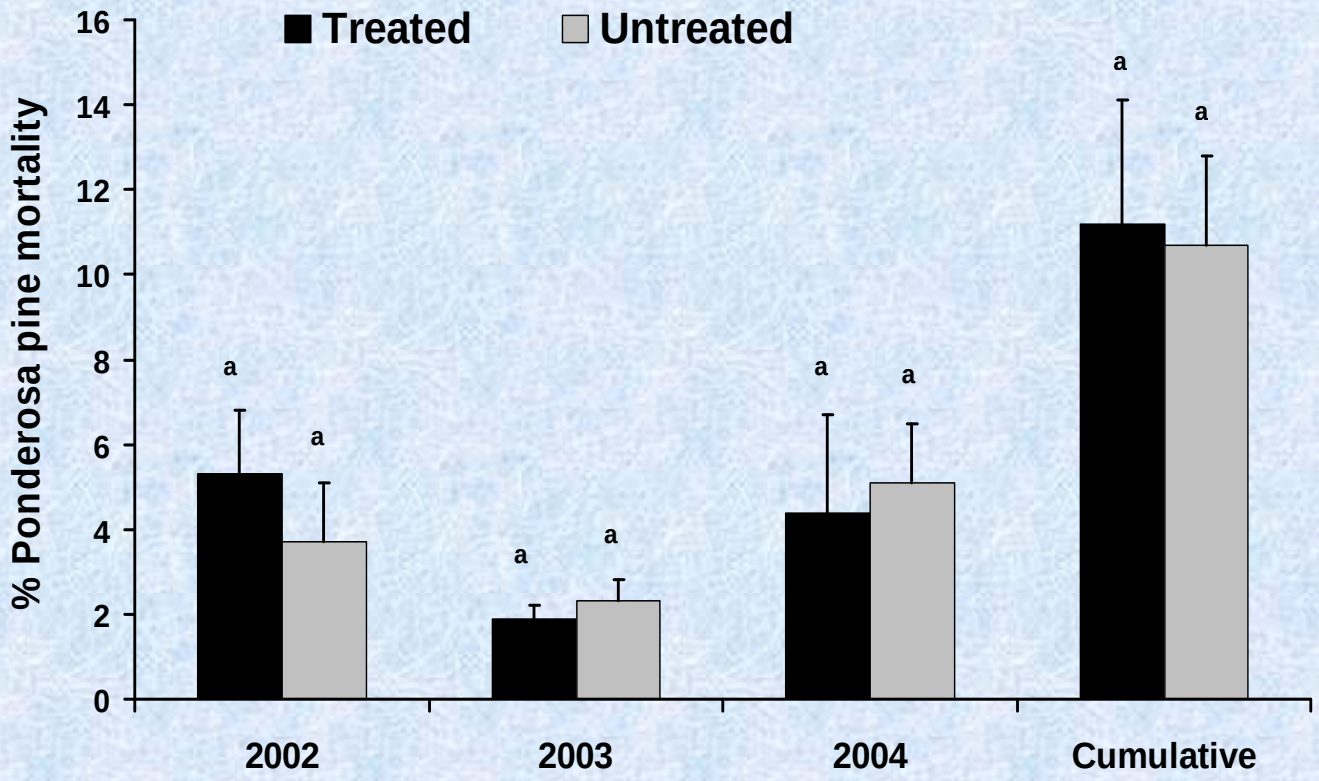
5 g verbenone pouches placed 9.1 m apart

Baited 3 trees in center of plot for 2 months

Three consecutive years

Tallied western pine beetle attacks that resulted in tree mortality occurring only during the treatment window.

NO SIGNIFICANT DIFFERENCE BETWEEN TREATED AND UNTREATED PLOTS.



NON HOST ANGIOSPERM VOLATILES (NAV)

Volatiles found in the bark and leaves of trees such as willow and poplar.

Initial test used a combination of 8 alcohols and aldehydes.

Significant trap catch reduction using NAV + verbenone over verbenone alone.

INDIVIDUAL TREE PROTECTION

60 ponderosa pine

30 treated and 30 untreated

Eagle Lake RD, Lassen NF in July 2005

Untreated = 15/30 (50%)

Treated = 4/30 (13%)

GC-EAD AND SUBSEQUENT TRAPPING BIOASSAYS

Gas chromatographic-electroantennographic detection (GC-EAD) analysis of the western pine beetle with several host and non-host volatiles, and subsequent trapping bioassays led to the reduction of the 9 component (NAVV) blend to a 4 component blend (Verbenone-Plus).

9 COMPONENT NAVV TRAP

PROTECTING INDIVIDUAL PONDEROSA PINE FROM WESTERN PINE BEETLE USING VERBENONE-PLUS

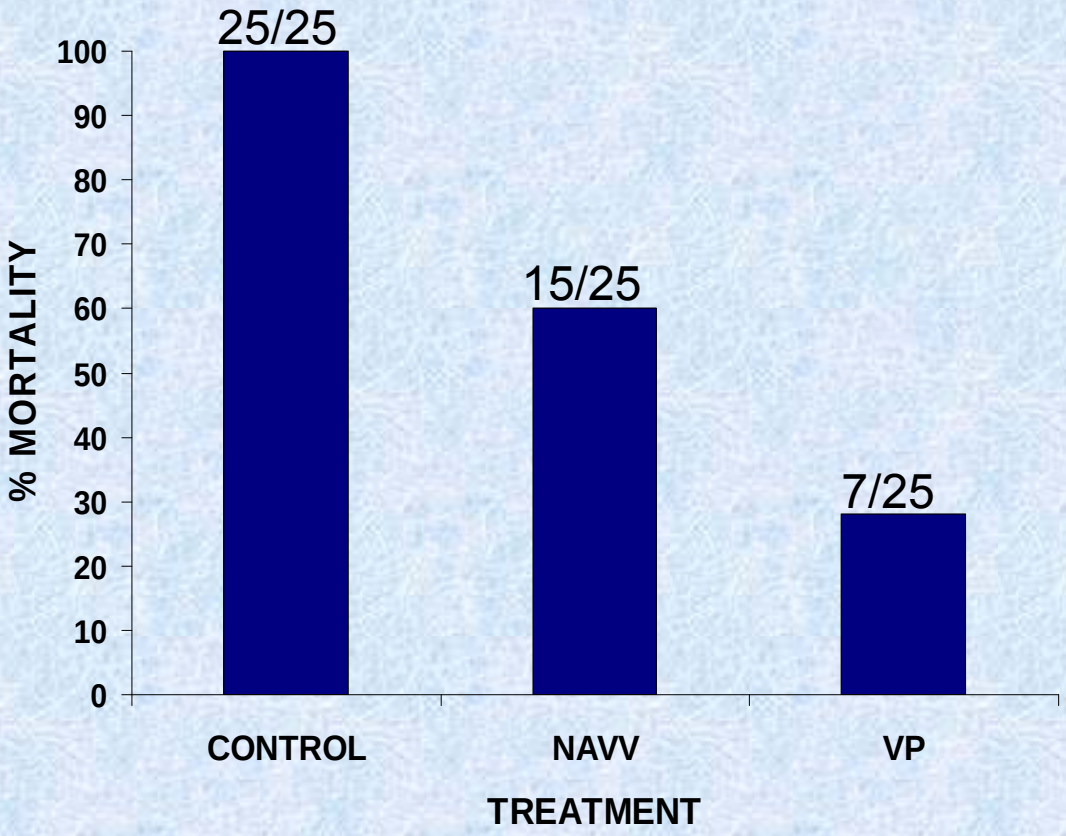
Conducted on the Big Valley Ranger District, Modoc National Forest.

75 ponderosa pines were selected with a spacing of >100 m.

Randomly assigned 3 treatments of 25 trees each: untreated control , 9 component NAVV, 4 component verbenone-plus.

All trees were baited with the western pine beetle bait for 21 days in August 2008, and assessed for mortality in July 2009.

RESULTS


25/25
15/25
7/25
100
90
80
70
60
50
40
30
20
10
0
% MORTALITY
CONTROL
NAVV
VP
TREATMENT

OPERATIONAL SUCCESS USING VERBENONE-PLUS

Don Owen – CAL FIRE Chris Fettig - PSW

Treated 37 ponderosa pine trees near Shingletown, CA early July 2009.

WHAT NEXT?

Test the efficacy of verbenone-plus for small scale stand protection.

All semiochemicals for the verbenone-plus projects were provided by Contech Enterprises, Victoria, BC Canada.